

## **Curriculum Vitae of Simona Rolli**

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### **Research Interests**

Collider Physics: Searches for physics beyond the Standard Model, currently working on CDF and ATLAS experiments. Data handling, data monitoring and validation, detector simulation (trigger).

### **Positions Held**

1999 to date Senior Research Associate, Department of Physics and Astronomy, Tufts University.  
1997-1999 Research Associate, Department of Physics and Astronomy, Tufts University.  
1996-1997 Guest Scientist, CDF group, Lawrence Berkeley National Laboratory.  
1994-1995 Visiting Scientist, Theory Division, Fermi National Accelerator Laboratory.  
1994 Visiting Scientist, NASA/Fermilab Astrophysics Center, Fermi National Accelerator Laboratory.

### **Education**

Jan 1996 Ph.D. in Physics, University of Pavia, Italy.  
Advisor: Prof. Mario Greco.  
Dissertation: “*Fragmentation Phenomena in Perturbative QCD: Fragmentation Functions Approach and Parton Shower*”.

June 1992 *Laurea* degree in Physics (equivalent to M.Sc.), University of Pavia, Italy  
(Score 110/110 *Magna cum Laude*).  
Advisor: Prof. Mario Greco.  
Dissertation: “*Light Mesons Production at LHC and SSC*”.

June 1988 *Diploma* in Piano (equivalent to M.A.), Conservatory of Music, Vicenza, Italy.

### **Academic Awards and Fellowships**

1996 Post Graduate Studies fellowship, awarded by Collegio Ghislieri, Pavia, Italy (Collegio Ghislieri is one of the eleven University Colleges recognized by the Italian Ministry of University and Research as academic centers of excellence).

1992-1995 Italian Ministry of University and Research – Ph.D. scholarship.

## Research Experience

- **Tufts University** **1997-present**
  - **Since 2009** - Leader of a CDF group focusing on searches for new non-SUSY particles

Appointed to lead a subgroup of the *Searches for new Particles* Physics Group to help expediting analyses and bring them quickly to the approval stage. This is accomplished thanks to the broad experience gained while leading the Exotic Physics group of CDF in the early stage of Run II and the broad knowledge of the analysis tools used by the experiment. The main goal is that of assuring a timely and continuous monitoring of the analyses that are carried on in the group. The meeting schedule has been restructured to this end, and the analyses are on track for blessing by end of 2010.
  - **Since 2009** - Validation of CDF software releases on new Linux versions

As a member of the code management team, revised and updated test programs to validate the execution of CDF software on different platforms. The software managers release CDF software and compiling/linking of current versions is still bound to SL3 version of the operating system. The validation assures that the CDF user can use the code on the most recent versions of the Linux operating system.
  - **Since 2007** - Architect and main developer of a suite of tools aimed at automating the calculation of efficiencies (identification, reconstruction, trigger, etc.) and scale factors for data and Monte Carlo which are used across physics groups

With Run II entering a mature stage, it was recognized that the majority of high  $P_T$  analyses use similar procedures and selection criteria but often repeat common tasks like calculating efficiencies. Such redundancy should be eliminated in order to maximize the physics output. PerfIDia (Performance and ID instant answer) is a suite of tools that provides common efficiencies and scale factors and establishes a validation procedure that is applied to data and Monte Carlo. It is used by all recently published CDF results. Analyses are streamlined, as common elements are made available centrally and in a coordinated fashion. A nice by-product of the PerfIDia suite is that of allowing for monitoring of data quality and stability in quasi real time.
  - **Since 2007** - Co-author of the Review of Particle Physics

Invited to co-author the review on leptoquarks for the most recent editions of the Review of Particle Physics, following the recognition of expertise in the field of leptoquarks.
  - **2006-2007** - Co-convener of the group working on the ATLAS CSC note on Single Top

The CSC notes were produced by the ATLAS collaboration as a way to update the results presented in the Physics TDR published in 1999 regarding the physics

reach and potential of the ATLAS detector. These new results made use of more realistic detector simulation and reconstruction algorithms. The appointment to be co-convener of the group followed previous activity in validation of the new simulation and in benchmarking of reconstruction algorithms.

- **2004-2005 - ATLAS physics studies**  
Performed Leptoquark sensitivity reach and b-tagging performance studies in the framework of single top analyses. The results were presented at several ATLAS workshops.
- **Since 2002 - Leader of the analysis effort in the search for leptoquarks at CDF Run II**  
With the increased physics reach of the upgraded Tevatron, the search for first generation leptoquarks was one of the first exotic analyses pursued with early CDF Run II data. It was selected because the signature of energetic electrons and jets could be swiftly understood and then expanded to include missing  $E_T$ , muon, tau and B-jet objects as the understanding of the detector evolved from a commissioning phase to a steady running phase. The analysis was one of the first approved by the collaboration, superseding the previous results from Run I. It was published in 2005. Since then, the effort was extended to include neutrino-jet first generation leptoquark decay modes, second and third generation leptoquark. The expertise gained in the first generation analyses was used to guide several Tufts students toward their theses at the graduate and undergraduate level.
- **2001-2002 - Leader of the New Particles Search (Exotic) Physics Group**  
In the early stages of CDF Run II, the expertise in the new software tools and data access was recognized as a key component for the activity of leading physics groups to obtain quick physics results. Signatures that could be understood fast were the first to be analyzed to pave the way for more complex ones. Traditional approaches were complemented by new signature-based investigations aimed at quickly confirm or exclude Run I anomalies. Several preliminary results, which were the direct result of the oversight as Exotic Physics Group Convener, were presented in the 2003 Winter Conferences.
- **Since 2001 - Co-author of the *evtNtuple* analysis Ntuple**  
*evtNtuple* was the first complete standard Ntuple used across the collaboration for the initial Run II data analysis. While more complex standard Ntuples were being developed, *evtNtuple*, as a flat representation of the event record living outside the CDF software environment, allowed for very quick data access and validation, reducing the latency related to the software development cycles of multiple releases and changes in object definition typical of an early stage experiment. Data were streamed immediately after offline reconstruction into *evtNtuple* and analyzed decoupling data analyses from the software development of more complex physics objects.
- **2000 - Leader of the CDF High Level Objects Group**

Contributed in the definition of high level objects for physics analysis, estimate of access patterns and maximum size of event data for realistic early run scenarios.

- **1999- 2000 - Leader of the CDF Exotics Triggers/Datasets/Tools group**  
Appointed to help the experiment in designing and implementing triggers optimized for new physics search and devise data access strategies to quickly get first results. This appointment was a result of the recognition of leadership in trigger simulation development and data access expertise.
- **Since 1999 - Leader of the CDF Trigger Simulation Group**  
TRGSim++ is a set of C++ packages that were developed to emulate the completely digital trigger at CDF II (L1 and L2). The packages were developed in collaboration with hardware experts, where the tasks of the leader were to provide a common software framework, deal with issues like data access, consistent data flow between different modules and packages and assure that all TRGSim++ was appropriately updated for different software releases. TRGSim++ is run online as the engine of the trigger monitor TRIGMON (in Control Room) and offline as an analysis tools to calculate rates and efficiencies.
- **1997-1998 - Author of several innovative studies regarding the use of an object oriented database as a storage system for CDF Run II data**  
Following ideas developed at CERN in previous years, the concept of separately storing different pieces of the event information on different media to optimize storage resources and data access was introduced at Fermilab. The concept of event splitting was used in CDF when designing multi-branch files residing on the same media. The ATLAS collaboration implemented the complete splitting of the event in different physical locations, using ROOT as the underlying storage technology and a relational database to manage metadata.
- Elected member of the Fermilab Users Executive Committee (2004-2005) and Co-organizer of the 2004 and 2005 Fermilab Annual Users' Meeting.
- Co-convener of the "Physics at highest  $Q^2$  and  $p_t^2$ " Working Group, for the International Workshop on Deep Inelastic Scattering (DIS2002). Krakow, May 2002.
- Supervisor of Tufts graduate students Dan Ryan (2004 Ph.D. Thesis) and Hao Sun (2007 Ph.D. Thesis), undergraduate students Gabriel Dunn (2008 Honor Thesis) and Matthew H. Vonhippel, as well as several summer students at Fermilab.
- Referee for Physical Review D, Review of Particle Physics (Particle Data Group), and internal referee for several CDF publications.
- **Lawrence Berkeley National Laboratory** **1996-1997**
  - Member of the CDF group studying the effect of gluon radiation in the determination of the correct jet energy scale used to measure the top quark mass.
  - MC representative for the top mass group.

- **Fermilab Theory Division** **1995-1996**
  - Phenomenology of vector bosons and jet production at the Tevatron.
- **Fermilab/NASA Theoretical Astrophysics Center** **1994**
  - Studies of phase transitions in the early universe.
- **University of Pavia** **1992-1995**
  - Studies of fragmentation phenomena in perturbative QCD. Fragmentation functions were derived from data fits for light and heavy quark production and used in calculating the production cross-section at NLO for light mesons and heavy flavor at fixed target experiment (E706), Tevatron and LHC energies. Such approach was compared with a parton shower approach, routinely used in the simulation of MC events.

### **Selected Talks**

- “Search for physics beyond the SM at the TeVatron”, Fermilab Users Meeting, June 2009.
- “Search for physics beyond the SM at the TeVatron”, invited talk at CIPANP 09, San Diego, May 2009.
- “Results from the TeVatron”, BNL Symposium, BNL, November 2008.
- “Search for BSM Physics at the TeVatron”, Pheno 2008, Madison WI, April 2008.
- “Top Physics at ATLAS”, CTEQ Workshop on Early Physics at the LHC, Lake Gull, Michigan, May 2007.
- “Top Physics at the LHC”, Pascos Conference, Ohio State University, September 2006.
- “B-tagging Performances”, ATLAS North American Physics Workshop, Boston 2006.
- “Single Top in Wt Channel”, ATLAS Standard Model Workshop, Argonne, April 2006.
- “Searches for BSM physics at the TeVatron”, I.F.A.E., Pavia, April 2006.
- “Single Top at Hadron Colliders”, I.F.A.E., Pavia, April 2006.
- “Recent Results at CDF”, BNL HEP Seminar, January 2005.
- “Search for Leptoquarks at Hadron Colliders”, Tev4LHC workshop, Fermilab, September 2004.
- “Recent Results from CDF High PT Physics”, Fermilab Wine & Cheese Seminar, April 2004.
- “Search for new particles at CDF II”, Moriond EW, 2003.
- “Physics at High  $Q^2$  and high  $P_T^2$ ”, Deep Inelastic Conference, Krakow, May 2002.
- “Status of the CDF II experiment”, LaThuile, March 2002.
- “Run II Triggers for SM Higgs Searches”, Snowmass, July 2001.
- “Search for new phenomena at the TeVatron”, La Thuile, March 1999.
- “Inclusive jet and dijets production at CDF”, Physics in Collisions, Stony Brook,

June 1997.

- “Top Mass Measurement at CDF”, Physics in Collision, Padova, May 1996.

## **Publications**

- About 450 scientific publications in refereed journals as a member of CDF and ATLAS Collaborations

Full list available from the Spire database.

- Selected Publications for which I am one of the primary authors

1. C. Amsler et al. (Particle Data Group), "The Review of Particle Physics", Phys. Lett. B667, 1, 2008.
2. CDF Collaboration, "Searches for second generation Leptoquarks at CDF Run II", Phys. Rev. D 73, 051102, 2006.
3. CDF Collaboration, "Searches for first generation Leptoquarks at CDF Run II", Phys. Rev. D 72, 051107, 2005.
4. S. Rolli, "Searches for new particles at CDF II", Proceedings of 38th Rencontres de Moriond, Les Arcs, March 2003.
5. G. Moortgat-Pick, S. Rolli, A.F. Zarnecki, "Physics at large  $p_T^2$  and  $Q^2$ ", Acta Phys. Polon. B 33, 3955, 2002.
6. S. Rolli, "The status of the CDFII experiment", Proceedings of 16th Rencontres de Physique de la Valle d'Aoste: Results and Perspectives in Particle Physics, La Thuile, Valle d'Aoste, Italy, Mar 2001.
7. Monarc Collaboration, "Distributed applications monitoring at system and network level", Comput. Phys. Commun. 140, 219-225, 2001.
8. S. Rolli et al., "Trigger Simulation at CDF", Proceedings of CHEP 2000, INFN Padova, p. 250.
9. S. Rolli et al., "Atlas event data model optimization studies based on the use of segmented VArray in Objectivity/DB", Proceedings of CHEP 2000, INFN Padova, p. 436.
10. S. Rolli, "Searches for new phenomena at the Tevatron: SUSY and technicolor", Proceedings of 13th Les Rencontres de Physique de la Valle d'Aoste: Results and Perspectives in Particle Physics, La Thuile, Valle d'Aoste, Italy, Mar 1999.
11. M. Cacciari, M. Greco, S. Rolli, A. Tanzini, "Charmed mesons fragmentation functions", Phys. Rev. D 55, 2736-2740, 1997.
12. S. Rolli, "Fragmentation functions approach in pQCD fragmentation phenomena", Proceedings of 31st Rencontres de Moriond: QCD and High-Energy Hadronic Interactions, Les Arcs, France, Mar 1996.
13. S. Rolli, "Top mass measurement at CDF", Proceedings of "Padua 1996, Hadron collider physics", pp. 449-461.
14. S. Rolli, "Light meson fragmentation functions", Proceedings of "Minneapolis 1996, Particles and fields, vol. 1", pp. 599-602.

15. Mario Greco and Simona Rolli, "Light mesons production at the tevatron to next-to-leading order", Phys. Rev. D 52, 3853, 1995
16. M. Greco, S. Rolli, A. Vicini, "Inclusive particle photoproduction to next-to-leading order", Z. Phys. C 65, 277, 1995.
17. S. Rolli et al, "Kinematical probes of neutrino mass", Proceedings of Snowmass Summer Study 1994, pp195-214.
18. S. Rolli "Transizioni di fase nel primo universo", Scientifica Acta, I Quaderni del Dottorato, Pavia, Volume IX, N 2, p. 77, 1994.
19. P. Chiappetta, M. Greco, J.P. Guillet, S. Rolli, M. Werlen, "Next-to-leading order determination of pion fragmentation functions", Nucl. Phys. B 412, 3, 1994.
20. M. Greco, S. Rolli, "Next-to-leading order eta production at hadron colliders", Z. Phys. C 60, 169, 1993.

- Selected Publications for which I provided oversight as a member of an internal CDF editorial Committee

1. CDF Collaboration, "Search for ZZ and ZW production in ppbar collisions at  $\sqrt{s}=1.96$  TeV", Phys. Rev. D 73, 052002, 2006.
2. CDF Collaboration, "Measurement of V+A Fraction in Top Decay at CDF at  $\sqrt{s}=1.8$  TeV" Phys. Rev. D 71, 091105, 2005.
3. CDF Collaboration, "Observation of Orbitally Excited B Mesons in ppbar Collisions at  $\sqrt{s} = 1.8$  TeV", Phys. Rev. D 64, 072002, 2001.
4. CDF Collaboration, "Search for the charged Higgs boson in the decays of top quark pairs in the e tau and muon tau channels at  $\sqrt{s} = 1.8$ -TeV", Phys. Rev. D 62, 012004, 2000.
5. CDF Collaboration, "Measurement of the top quark mass and t anti-t production cross-section from dilepton events at the collider detector at Fermilab", Phys. Rev. Lett. 80, 2784, 1998.
6. CDF Collaboration, "The mu tau and e tau decays of top quark pairs produced in p anti-p collisions at  $\sqrt{s} = 1.8$ -TeV", Phys. Rev. Lett. 79, 3585, 1997.